OPTO-ELECTRONIC MODULES AND METHODS OF MANUFACTURING THE SAME AND APPLIANCES AND DEVICES COMPRISING THE SAME

[0001] CROSS-REFERENCE TO RELATED APPLICATION(S)

[0002] This application claims priority from U.S. Provisional Patent Application No. 61/509,346, filed on Jul. 19, 2011, the contents of which are incorporated herein by reference.

TECHNICAL FIELD

[0003] This disclosure relates to the field of opto-electronics and more specifically to the packaging and manufacturing of opto-electronic components. More particularly, it relates to opto-electronic modules and to methods of manufacturing the same and to appliances and to electronic devices comprising such modules, in particular wherein the modules comprise at least one light detector. The

BACKGROUND

[0004] From US 2010/0327164 A1, an opto-electronic module, more specifically a proximity sensor is known, during the manufacture of which light emitter dice and light detector dice are overmolded using transfer molding techniques so as to form lenses on these dice.

[0005] In U.S. Pat. No. 5,912,872, an integrated optical apparatus is presented. In the manufacture thereof, a support wafer having a plurality of active elements thereon is aligned with a transparent wafer having a corresponding plurality of optical elements. Such a support-transparent wafer pair may then be diced apart.

[0006] In US 2011/0050979 A1, an optical module for an electro-optical device with a functional element is disclosed. The optical module includes a lens substrate portion with at least one lens element, and a spacer. The spacer serves to keep the lens substrate at a well-defined axial distance from a base substrate portion of the fully assembled electro-optical device. In order to ensure an improved performance of the functional element, an EMC shield is provided. The spacer is at least in parts electrically conductive and thus forms the EMC shield or a part thereof. A method of manufacturing a plurality of such modules on a wafer scale is also disclosed in US 2011/0050979 A1.

DEFINITION OF TERMS

[0007] "Active optical component": A light sensing or a light emitting component. E.g., a photodiode, an image sensor, an LED, an OLED, a laser chip.

[0008] "Passive optical component": An optical component redirecting light by refraction and/or diffraction and/or reflection such as a lens, a prism, a mirror, or an optical system, wherein an optical system is a collection of such optical components possibly also comprising mechanical elements such as aperture stops, image screens, holders.

[0009] "Opto-electronic module": A component in which at least one active and at least one passive optical component is comprised.

[0010] "Replication": A technique by means of which a given structure or a negative thereof is reproduced E.g., etching, embossing, molding.

[0011] "Wafer": A substantially disk- or plate-like shaped item, its extension in one direction (z-direction or vertical direction) is small with respect to its extension in the other two directions (x- and y-directions or lateral directions). For example, on a (non-blank) wafer, a plurality of like structures or items are arranged or provided therein, e.g., on a rectangular grid. A wafer may have opening or holes, and a wafer may even be free of material in a predominant portion of its lateral area. Although in many contexts, a wafer is understood to be prevailingly made of a semiconductor material, in the present patent application, this is explicitely not a limitation. Accordingly, a wafer may prevailingly be made of, e.g., a semiconductor material, a polymer material, a composite material comprising metals and polymers or polymers and glass materials. In particular, hardenable materials such as thermally or UV-curable polymers are interesting wafer materials in conjunction with the presented invention.

[0012] "Lateral": cf. "Wafer"

[0013] "Vertical": cf. "Wafer"

[0014] "Light": Most generally electromagnetic radiation; more particularly electromagnetic radiation of the infrared, visible or ultraviolet portion of the electromagnetic spectrum.

SUMMARY

[0015] Some implementations provide one or more of the following advantages. For example, some implementations create an alternative way of manufacturing opto-electronic modules. More particularly, a particularly fast way of manufacturing opto-electronic modules and/or a particularly simple way of manufacturing opto-electronic modules can be provided. In addition, the respective opto-electronic module, an electronic device comprising such an opto-electronic module and an appliance comprising a multitude of such opto-electronic modules can be provided.

[0016] Also, some implementations provide opto-electronic modules having a particularly accurate alignment and a corresponding manufacturing method.

[0017] Further, some implementations provide opto-electronic modules of particularly small dimensions.

[0018] Some implmentations provide opto-electronic modules comprising at least an active and possibly also a passive optical component which are well protected against stray light and/or cross-talk.

[0019] Also, some implementations provide particularly small electronic devices comprising at least one opto-electronic module.

[0020] According to one aspect, for example, a method for manufacturing opto-electronic modules comprises:

[0021] a) providing a substrate wafer on which a multitude of detecting members are arranged;

[0022] b) providing a spacer wafer;

[0023] c) providing an optics wafer, the optics wafer comprising a multitude of transparent portions transparent for light generally detectable by the detecting members and at least one blocking portion for substantially attenuating or blocking incident light generally detectable by the detecting members;

[0024] d) preparing a wafer stack in which the spacer wafer is arranged between the substrate wafer and the optics wafer such that the detecting members are arranged between the substrate wafer and the optics wafer.

[0025] This may allow manufacturing of opto-electronic modules in a particularly efficient way, and may allow manufacturing of particularly small opto-electronic modules. Fur-